Notebook, N-01-04-30

Melting pt of

| | |
|---|---|
| Cd | 608° F. |
| Zn | 775 788 |
| Pb | 842 |

| | |
|---|---|
| Bi (108) | 515 |
| Sn (224) | 496 |
| Pb 330-335 | 697 |

| | |
|---|---|
| Sn | 496 |
| Bi | 515 |
| Cd | 608 |
| Pb | 697 |
| Zn | 780 |
| Sb | 842 |

April 30th 1917

Experiments on making active Iron oxide for Storage battery.

Previous Expts are recorded together with the results of the electrical tests of corresponding grids.

Apr 30th

1) 10g of Fe.Cl3 made from
Oxalate of Iron by ignition
in Crucible, plenty of air
being passed through same,
is kept in steam of H
for 1¼ hour at 700 - 800°F
Tube shaken at
intervals.
After heat is withdrawn,
H is passed for ½ hour.
Appearance: greyish
Still magnetic.
Grind:

Apr 30th No. 2

Same material as No I

kept in H for 1½ at 650-700°

and for 10 hours after cooled down

Appearance blacker than I

---

Assay I

Same most as before

1½ in H at 650-700° gradually

White-higher black

(Sooty lumps)

May 2nd. IV

10g $Fe_2O_3$ from Oxalate.

Start 1030.

Temp at 1032 : 685 F°
(by asymptotic method)

" 10.45 645°.

11.15 635°

Stop: 11.30

Le Chatelier Curve

Ran long excess all the time. Cooled fast and kept on 14 for 7½h (little precipitate)

[9]

May 3rd V

Bog Reids from Oxoloth.
and one grid ~~passed~~
of same shift.

| | | |
|---|---|---|
| Start | 10 50 | 550°F |
| | 11 00 | 570 |
| | 11 05 | 600 |
| | 12 01 | - - - same |
| | 12 05 | Blown out |
| | 12 10 | 520° |

Opened for cooling.
Bird repressed at 5 4 30 100 Atm. (376)

[illegible]

May 6th

Run VI

500g $Fe_2O_3$ from oxalate

Temp estimated to 800°–900°

1¼ hours. and in H for 4h.

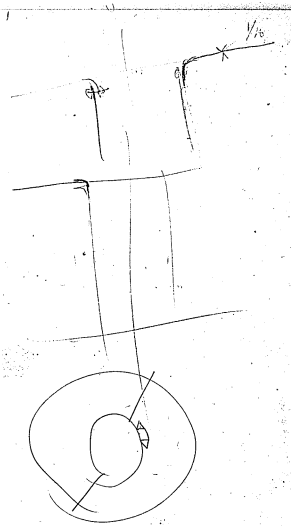
Gas regulator covered with 1lb. weights & rings belonging to same.

Siller gas jet for regulating flow of H at a certain position which is to be maintained.

Reed block and flame.

Pressure shows high minimum of

C13] Fe metal




May 7th

Run VII

Temp between 775 and 842 °F

50g. Te$_2$O$_3$ from Apalachin. Same pressure and opening as in VI

1¼h and 15h in H

Divided into two parts one gray (VII a) near inlet and one black (VII) near exit. Dots of iron on gray part (proved by Browning)

| | A | B |
|---|---|---|
| 1 | 7257 boat | 7.387 |
| 2 | 8.445 loaded | 8.682 |
| 3 | 8.260 Reduced | 8.484 |
| 4 | 8.638 oxidised | 9.893 |

The reduced iron got slightly oxidised before weighing. The oxidising probably only $Fe_3O_4$ on outer surface since same and $Fe_2O_3$ was produced so this may not get three results corresponding the reduced stuff. Fe. oxidises to $Fe_2O_3$ $Fe_3O_4$

A
1) $Fe_{5.04}$
2) $Fe_5O_7$
3) $Fe_5O_8$

B. 1) $Fe_{8.05}$
2) $Fe_8O_8$
3) $Fe_{8.04}O_8$

$Fe_5O_8$ as average
$2 Fe_2O + FeO$

VIII May 8th

$Fe_2O_3$ from Oxalate by heating in closed vessel gives of $1/4$ $O_2$ and ferric magnetic

IX May 8th

(Oxalate contains 25% $H_2O$)

- Kg Oxalate to 10g $Fe_2O_3$;
this is the best proportion
for all going into $FeO$.
as $FeC_2O_4$ decomposes
into $Fe$ and $2CO_2$.

$$Fe_2O_3 + FeC_2O_4 = 2FeO + FeO + 2(CO_2)$$

Fine block after heating in
glass tube at point of
decomposition and leaving
in it for 12 hours.

Bromine stores no time after.

X

$3\,Fe_2O_3 + Fe\,C_2O_4$

$= 2\,Fe_3O_4 + FeO + 2CO_2$

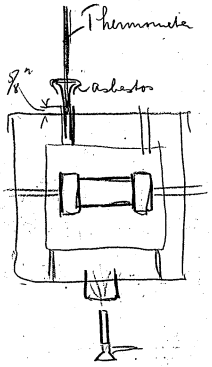
2g oxalate (mixt) to 5g $Fe_2O_3$

Mercy 9th

Rum XI

Duplicate of V,

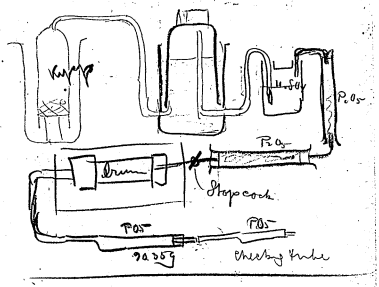
that oxidized in air.

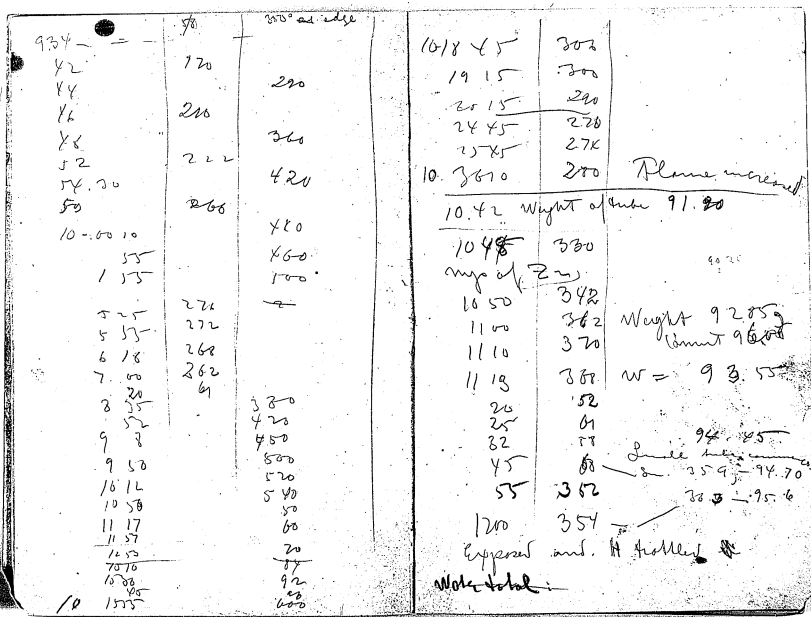



Mag. of Rise VII

Weight of Phosphorus anhydr. tube : 90.35 g, of checking tube 95.84

Arrangement





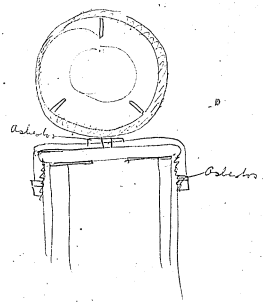
98.6 − 90.35 = 5.25
36.3 − 35.85 = .45
5.70g

Theoret 5.62g

$Fe_2O_3$ — 11.0
160 — 18
56 — 1
5.62g

Taken out at 10 am
using 10lbs (9 hours)

Just posts XII & XII A
, A being a little more
intensive block




May 10. Run XIII

50g of nonweyan thermostable ground to 200 mesh size and roasted well

Drum and load heated to 300°F and air blown through to drive off moisture (drum possibly not followed thermometer and consequently eventually some moisture left)

Started H₂O at 11:45 200°F on thermometer in 5/8" position

Weight of anhydrous tube 158.5 g

Glass tube holding thermometer broke in course of moisture.

Drum melts 282 on new

Quite. — 28 i at 11.50

11 20 -
11 50 — 30 — expose
55 — 90
Zn must have melted by
burning on combed wooden
copper box, as a piece of
steel left suspended in
the middle of bath.
9200 — 2 gs Zinc gone
1205 — weight — 161.5
1110 — 304° F
1220 — 303
— weight 163.5
Off — 1225 — 163.5
158.5
5.0

Mag Mtl - Run XIV

50 g Norway (magnetite) ore 200 mesh and washed.

$Fe_3O_4 = Fe_2O_3 + O$

232 = 216 + 16

232 : 16 = 50 · x  x = $\frac{16 \cdot 50}{232}$ = 3.45 g O or 3.77 g $H_2O$

130 — Flow current of nitrogen through Mtl Furnace. Temp stayed at 350 for 15 min.

180 — 380° H started

Weight of tube 185.78

| | |
|---|---|
| 155 | 530° |
| 156 | 560 |
| 170 | 570 |

Hydrogen lighted at 7½ pressure

1.58 345
58-20 20
2 00 280
01 67
02 30 69
2 04 20 66
220 ~30 mpo Fe (725)
25 Wright 158 gr
~~1775~~

Pressure in tube stopped up and H with this partially escaped through leaks. —

$2Cr_2O_4 = 3Fe_2O + 5O$

8.5g $H_2O$

Run XV

85g Magnetite 200 mesh.
Air blown through till
828 °F — °M started at
457 328° at 5/8 past
Weight of tube at
start 147.854g
520 338
Wright 150.2
532 838° 157.7
5.50 880 153.7 (6g)
Tube broke —
Left on 5 more
min opened —

May 12 XVI

Nickel oxyde

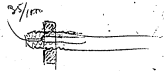
20g heated in porcelain and dried in current of air

N started at 10 hrs 38.8 gr at 5h

Weight of tube 38.7 gr

| | |
|---|---|
| 9 11 45 | 320 |
| 13 00 | 340 |
| 13 40 | 350 |
| 11 05 | 380 |
| | 400 |
| | 420 |
| 17 10 | 480 |
| 11 20 | 500 |
| 21 | 350 |
| 12 | |
| 22 20 | 320 |
| 23 | 300 |
| 12 | 290 |
| 50 | 280 |
| 24 25 | 270 |
| 25 15 | 260 |
| 26 00 | 250 |

1"




according to curve Zn will melt at 292 - 294

May 13th XVII

Nickel oxide (Coghill) 50g in crucible burnt (improved melt)

The oxide contains very little moisture - about .2g in 20g.

Drum heated. Hell 000 and air passed through to dry oxide

Start 1934 Wt of tube Temp 242 (93.9g.

955 282

10.10 Engine at 295°

At 10.15 Phosphorous tube connected and wt crossed a weight 4.5g (of 5.5 Mechanical

[41]

57 + 16 = 25
150 — 16
50 — 5.33

Therefore continued till 10.22, when heat is withdrawn and Drum exposed.

A 7268
B08

112
A1/8
760

May 14th

Run XVIII

50 g. of "Sub-carbonate of Iron (very little carbonate) dried at 100° in vacuum weighed 30·2 loss

Weight of Calcined 18.75

" $P_2O_5$ " 75.15.5

50 g. of Sub-carbonate
40 g — $Fe_2O_3$
which by reduction to

$Fe_2O$ gives off
$Fe_2O_3 = Fe_2O + O_2$
160 — 32
40 — 8 g.

50 g. = 14 g. O
40 g. = 8 g. O
or 9 g. $H_2O$

[43]

Reversible photochemical reaction — Mercury vapour lamp at back — Mercury vapour lamp at front

Analysis of product

Weight of boat 7.254
Loaded 9.686
Reduced 9.08

1.826 Ti ; .546 O

2.826 : 3.75

Nearest to $TiO$ with little $Ti_3O_4$

| | |
|---|---|
| 400 | 4.58 |
| 450 | 4.5 – 50 |
| 500 | 4.7-00 |
| 550 | 4.9-05 |
| 600 | 5-11 45 |
| 650 | 11 52 |
| 700 | 12 86 |
| 750 | 13 03 |
| 800 | 13 20 |
| 2 50 | 18 — |
| 2 00 | 18 20 |
| 2.30 | 25 |
| 2.205 | 1.36-00 on |
| 220 | 10.75 |

or 1825 cucc. 182.6
$R_L\theta_5$ 75.17

Increase on Mg

11.15 222 188.3 g
75.20
11.45 189.85
182.75
6.70

Run Nickel with excess of iron, keep current constant at 150 m/A and read E and S. Then charge same at 150 m/A and read volts and estimate rate of gassing.

Same for iron.

By running for the Ni - first 1½ hours and discharging - then 3 hours gassing - then after some points is reached and discharged and at last 7 hours after gassing and discharge - the loss by gassing will be determined and at the same time the most favorable points for cutting out.

XLV count : C 175.5

| | | |
|---|---|---|
| 4.35 | 213 | 164.2 |
| 40 | 220 | |
| ~~45~~ | 214 | |
| 5 35 | 218 | 168.5 |
| 5.55 | 224 | 169 2 |
| 6 20 | 222 | 173.8 ? |
| 6 30 | 40 | |
| 6.55 | | 174.9 |

cut off

Drum is not perfectly tight –

Room Temp 815° F.

Left in H over night – but cooled quickly. Or – is permanent condition of H

XLV (duplicated)

100 g. $FeO_3$ from Oxalate.

Weight of $CaCl_2$ 144.8 g.
15.75
163.55 g.

Sn melts at 152

| | |
|---|---|
| Pb | 70. |
| Cd | 84. |
| Bi | 93. |
| Zn | 210. |

| | | |
|---|---|---|
| Start 10.25 | 216. | |
| 25 | 14. | |
| 45 | 13 | |
| 50 | 25. | |
| 55 | 28. | |
| 11.– | 29. | 147.5 |
| 05 | 18. | |
| 10 | 16. | |
| 15 | 29 | |
| 20 | 33. | |
| 25 | 55. | |
| 30 | 33. | 149.5 |
| 35 | 52 | |
| 40 | 30. | |
| 45 | 27. | |
| 50 | 26. | |
| 55 | 29. | |

12. 00 Cum. – 225 – 151.2
05 – 21.
10 – 20.
15 – 20.
20 – 20.
25 – 24.
30 – 26. – 152.8
35 – 19.
40 – 25
45 – 31
50 – 30
7 00 – 35. 158.5
10 – 30
20 – 30 155.6
50 – 225 – 156.5
158.2 55 – 27. (129.5)
7.05 2 – 28.
– 14 5.12 05 – 27.
10 – 30.
20 – 31.
25 – 31.
30 – 32 – 139.5
40 – 32.
47 – 26.
55 – 29.
3 – 32. 142.0

3. 10 – 240.
20 – 41.
30 – 26 – 143.6
35 – 35.
45 – 30
50 – 30 – 145.1

Ok

* 628 & 629

XLVI Feb. 1909

Wts from order

Weight of KOH 192.2

| | | | |
|---|---|---|---|
| 8.00 | = ~ 600° | 205.5 | |
| 8.15 | ~ 600 | 1200 | |
| 8.35 | ~ | 178 | 193.3 |
| 9.30 | ~ | 174 | 198.65 |
| 10 10 | | 202 | |
| 10 30 | | 220 cl | |
| 12 15 | | 230 | 198.5 |
| 1 15 | | 236 | |

Ammonia 1.

XLVII

Ammonia

Weight of KOH - 199.3 gr. 9.35

Cl. melts at 183, 208.65

| | | |
|---|---|---|
| Start | 7.30 | 191. |
| | 40 | 93. |
| | 45 | 90 |
| | 50 | 89 |
| | 55 | 88 |
| | 8. — | 89. |
| | 10 | 89. |
| | 20 | 87 |
| | 30 | 83 — 199.65 |
| | 40 | 82 |
| | 50 | 90. |
| | 9. — | 92. |
| | 10 | 92. |
| | 20 | 90. |
| | 30 | 92 — 201.8 |
| | 40 | 99 |
| | 50 | 200 |
| | 10. — | 200 |
| | 10 | 200. |
| | 20 | 02 |
| | 30 | 04 — 202.25 |

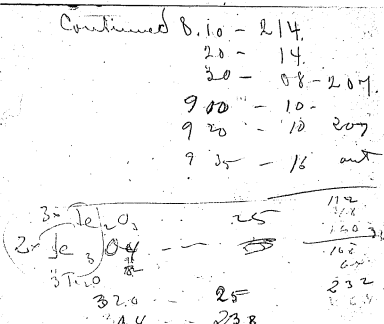
Continued

10.40 – 204
50 – 196
11. – – 93
10 – 92.
20 – 85.
30 – 80 – 202.6
40 – 85
50 – 96
12. – – 203
10 – 08
20 – 11.
30 – 11. 203.4
40 – 12.
50 – 12.
1. – – 15.
10 – 12.
20 – 13.
30 – 13. – 204.0
40 – 14.
50 – 14.
2. – – 15.
10 – 15.
20 – 15.
30 – 15. – 204.7
40 – 16
50 – 17
3. – – 18

Continued

3.10 – 218.
20 – 20.
30 – 22 – 205.2
40 – 23
50 – 24
4. – – 25
10 – 25
20 – 25
30 – 23 – 205.5
40 – 24
50 – 23
5. – – 23.
10 – 25.
20 – 26.
30 – 28 – 205.8
40 – 28
50 – 28
6. – – 25
6.30 – 20
40 – 17 – 206.8
50 – 17
7. – – 16
10 – 17.
20 – 15 – 206.8
30 – 14
40 – 14
50 – 14 – 207.
8. – –

Continued 8.10 – 214.
20 – 14.
30 – 08 – 207.
9 00 – 10 –
9 20 – 10 207
9 35 – 16 ant



$O_2 = 6.25$

$CO_2 = \frac{44}{32} \times 6.25 = 8.6\,g$

$8.6\,g\ CO_2$ ($CaCO_3$)

XLVIII. June 19th.

25 gr. $Fe_2O_3$

Weight of KOH 262.5
5.6
267.1

Start 10.10 – 227 (Wt 226)
20 – 23
30 – 26
40 – 26
50 – 26
11. – 28 – 263.4
10 – 26
20 – 22
30 – 11.
40 – 14.
50 – 24.
12. – 25 – 265.
10 – 26.
20 – 26.
30 – 26.
40 – 28.
50 – 28.
1. – Dull. – 29 – 265.5
10 – 30
20 – 30
30 – 30 [125]

Cont. 1.40 – 2 31.
50 – 31.
2. 1 – 31 – 2 66.1
10 – 32
20 – 33
30 – 34
40 – 34
50 – 29
3. 1 – 27 – 2 66.5
10 – 26.
20 – 25.
30 – 24.
40 – 27.
50 – 30 – 2 66.8
4. 1 – 30
10 – 30.
15 – 30.
20 – 32.
40 – 32.
50 – 32. – 267.2
5. 1 – 35
10 – 34
20 – 34
30 – 34
40 – 33
45 – 32. – 268.0
6. 10 – 26.
30 – 27
40 – 27
50 – 27

~~Mont air 3275~~
" " 325

Fe alone ~~280~~ 280
FeNi ~~275~~ 1414
Fe liquid 268
Ni alone
Ni liquid ~~275~~ 275

Cont. 7. – ~~Mt~~ 27 | 268.3
10 – 30
20 – 31
30 – 30 – 268.5
40 – 28 – 269.
12 – 36 – 269.4
2 – 36 – 273

May 25th Ni 325
Fe 330

| Charging | | test | |
|---|---|---|---|
| 9.20 | 1.16 V | 156 Ta. | |
| 27 | 136 | | |
| 9.48 | 149 | 153 | |
| 1000 | 152 | 145 | |
| 1016 | 154 | | |
| 1032 | 155 | | |
| 10 45 | 155 | 148 | First trace of gas on Ni |
| 11 00 | 156 | 156 | Trace of gas on Fe. Nickel came in gas very fast |
| 1115 | 156 | 150 20 Ta Ni 1/10, Fe trace | |
| 1130 | 155 | 147 280 Ta | |

This is about half charge for Ni. Fe gives at the rate about 1/7 - 1/8 of total capacity. Fe handles 1/50 - 1/70 th

| | | | |
|---|---|---|---|
| 1145 | 157 | 150 | Ni 1/4 |
| 1200 | 140 | | |
| 1.00 | | | |
| 1 30 | 161 V. | 145 A | Ni 2/3 Fe very slight |
| 145 | 155 | 155 | " |
| 200 | 166 | 140 | Ni 3/4 - 1 |
| 230 | 169 | 158 600 Ta. | Ni full rate Fe 1/2 |

[178]

Continued

| Time | Volts | Current | Rate of Spring |
|---|---|---|---|
| ~~2 hrs~~ | | | |
| 225 | 169 | 146 | |
| 243 | 172 | 151 | |
| 255 | 170 | 170 | |
| 320 | 176 | 177 | Pulse full rate. |
| 345 | 176 | 165 | |
| 500 | 126 | 159 | |

$3Fe_2O_3 = 480 \mid 16$

$2Fe_3O_4 = 464 \mid 16$

$2FeSO_4 = 3Fe_2O + SO$

$SO = 80$

$480 : 80 \quad SO = 41.6 = 8$

$80 : X \quad C = 12$

$X = 6.66\ g$

$\frac{44}{32} \times 6.66 =$

$6.88\ g\ CO_2$

June 20th XLIV

30c of oxolate Fe heated carefully so as to prevent conglomeration during ignition. Heated to 280° (850°) passing air, when was started when Temp at 285°.

CO from $K_4Fe(C_2O_4)_3$ and $H_2SO_4$ dried over KOH and $CO_2$ formed by reduction of oxide absorbed by KOH

Start: 530 235°

Weight ~~Cl Cl~~ W2g
2.48.88
KOH

| | | | |
|---|---|---|---|
| 830 | 320° | 2462 | |
| 4 | – 16 | | |
| 9 | – 28 | – 247.2 | |
| 15 | – 24 | | |
| 25 | – 30 | – 248.4 | |
| 35 | – 36 | | |
| 45 | – 40 | – 248.8 | |
| 50 | | | |

Off

Ferro = Uro | 32
Ferb =

160 – 20
20 – x
x = 6g.

6% Uro

I. June 21st

2 g. of oxalate of Fe.

To be dispersed of 2g of Cl₂ (corresponding to start Fe 2 g)

Weights of KOH 2.48.8 g
2.51.8

| | | |
|---|---|---|
| Start at | 1.00 Clock – | 235° |
| | 10 – | 48 |
| | 20 – | 52 |
| | 30 – | 50 – 250.6 |
| | 40 – | 47 – |
| | 45 – | 47 – 252.0 |

Off

[135]

I I. wire 22nd.

[redacted]

Height of [redacted] cell 252.2

255.9

Start 2.10 – 180.
15 – 2.20.
20 – 52.
35 – 11.
40 – 14.
45 – 18.
50 – 12.
55 – 12:
3. – – 08 – 253.7
08 – 02
15 – 10.
25 – 13. 254.6
30 – 13
38 – 14.
48 – 08
4. – – 12 – 255.15
10 – 10
20 – 09
30 – 02 – 255.5
40 – 00

To loose 6.7g Hrs.

Conversion of manometer after the mean 6.7 is about 1/65

4.50 – 316
5. – – 32 – 255.9
10 – 52
20 – 57
30 – 66 – 256.9
40 – 54
50 – 53
6. – – 51 – 257.9
10 – 52
20 – 57
30 – 56 – 258.7
7. – – 54. 259.9

[137]

June 22nd

## L 11

145 – 150 g of Fe O
from Axolotl liver
coarse roasting bulb
red heat in hydrogen
heated to about
in slow current
blown – air (to reduce
it to $Fe_3O_4$) and
then reduced in
H at a temp
between Zn & Sb.
This should be a

Phosphate of iron
best runs, 21, 43, 45

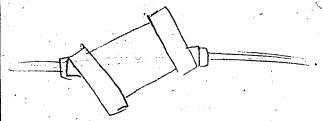
Weight of Fe O 9.7 g.
Zn at 2.42. 8.6.7

Start 11.00 – 2.52.
20 – 56.
30 – 56 – 2.66
Start again 11.45 – 55 – 2.44.4
12. – 60.
20 – 61.
30 – 62. 248.4
45 – 65.
1. – 66 251.2
10 – 68.
20 – 68.
30 – 64 – 254.4
40 – 64
50 – 61.
2. – 64 256.2
10 – 61.
20 – 63.

| | | | |
|---|---|---|---|
| 2. | 30 | 65 | 258.2 |
| | 45 | 63 | |
| 3. | — | 72 | 259.1 |
| | 15 | 64 | |
| | 30 | 70 | 262.5 |
| | 40 | 70 | |
| | 45 | 64 | 263.3 |
| | 50 | 70 | |
| 4. | — | 76 | 263.5 |
| | 10 | 64 | |
| | 20 | 66 | |
| | 30 | 65 | |
| | 45 | 80 | |
| | 50 | 90 | |
| 5. | 00 | 79 | 264.4 |
| | 10 | 82 | |
| | 20 | 86 | 264.9 |
| | 25 | | |

Off

The crop contains big lumps of conglomerated grain. Has head been high or is crop to [illegible]. — [illegible] Grain must be cleaned thoroughly and chaff must not exceed 12 oz.



I. 111. June 24th

100 g. of $Ca_2 O_3$ from Oxalate of Ca.

Weight of $CaCl_2$ 230 g. 19-2 g.

Zn at 2 9/4 at 2.55

| | | |
|---|---|---|
| Start 3.10 | – 2.74. | |
| 20 | – 64. | |
| 30 | – 74 | |
| 40 | – 80 | |
| 50 | – 87 | |
| 4. – | – 90 | – 238.5 |
| 10 | – 94 | |
| 20 | – 88 | |
| 30 | – 90 | |
| 40 | – 92. | |
| 50 | – 94 | |
| 5. – | – 90 | – 238.6 |
| 10 | – 95 | |
| 20 | – 96 | |
| 30 | – 97 | |
| 40 | – 96 | |
| 50 | – 93 | |

| | | |
|---|---|---|
| 6.00 | – 290 | – 240.5 g. |
| 10 | 300 | |
| 20 | 288 | |
| 35 | 218 | 241.75 |
| 45 | 18 | |
| 7. – | – 18 | |
| 10 | – 34 | |
| 25 | – 16 | |
| 30 | – 06 | – 243.9 |
| 40 | – 15 | |
| 50 | – 14 | |
| 8.00 | – 03 | – 245.4 |
| 10 | – 287 | |
| 20 | – 86 | |
| 30 | – 316 | – 246.3 |
| 40 | – 30 | |
| 50 | – 34 | |
| 9.00 | – 29 | – 247.5 |
| 10 | – 30 | |
| 20 | – 31 | |
| 30 | – 55 | – 249.2 |

[143]

LIV. June 25th.

100 g. of $Be_2O_3$ from Oxalate of Gl.

Weight of $Ca\,O_2$ – 249.2
21.–
270.2

Gum mastic

Start 10.20 – 32.0
30 – 40
40 – 40
50 – 55
11. 00 – 54 – 254.1
10 – 62
20 – 45
30 – 35 – 255.2
40 – 37
50 – 32 – 256.1
12. – – 38
10 – 47
20 – 58 – 256.4
30 – 57
40 – 46
50 – 46 253.4

1.45 – 341
2.00 – 45 – 255.8
10 – 45
20 – 38
30 – 44 – 260.5
40 – 45
50 – 50
3. 00 – 65 – 264.9
10 – 65
20 – 70
30 – 70 – 263.2
40 – 60
50 – 64
4. – – 64 – 264.5
10 – 68
20 – 62
30 – 75 – 265.5
40 – 70
50 – 72
5. – – 77 – 260.5
10 – 70
20 – 64
30 – 66 – 267.5
40 – 68
50 – 68
6. 00 – 55 – 268.5
10 – 48
20 – 65 – 269.0
30 – 3 70 – 270.–
45 – off!

# IV.

1.00 g. of $H_2O$ from Chpalata of Sr

Weight of $SrCl_2$ — 2.5498 g.

Drum at 800°

66.2° at Siemens.

2.554.9
1.9
2.543.9 about 800 at elevated Pt

| | | | |
|---|---|---|---|
| 5.5 | | 580 | 66.3 |
| " | 20 | 79 | 66.2 |
| | 25 | 77 | 66.1 |
| | 30 | 74 | |
| | 35 | 72 | |
| | 40 | 70 | |
| | 45 | 77 | 65.8 |
| | 50 | 79 | |
| | 55 | 78 | |
| 6. | 00 | 74 - 262. g. | |
| | 15 | | 65.6 |
| | 30 | | 66.4 |
| | 40 | 600 | |
| | 45 | " | |
| | 55 | " | |
| 7. | 1 | " - 2.66. | |
| | 10 | 540 | |
| | 20 | 40 | |

7. 30 - 555 - 266.2
40 - 560 -
50 - 524
8. - - 57
10 - 50
20 - 600
25 - 540.
30 - 723 - 267.5
40 - 509
55 - 582.
9 05 - 65.6
9 15 - 66
30 - 66.4

Drum dropped up.

July 2nd.

I VI

100g Ferric from Oxalate.
Weight of ppt in 200cc
To be reduced at 800°
All Cold, Tube Increas

189

| | |
|---|---|
| 187°7 | 48 5 |
| 242 | 57.9 |
| 360 | 14.6 |
| 418 | 559 |
| 456 | 5.6.4 |
| 504 | 57.9 |
| 554 | 59. |
| 600 | 53.1 |
| 640 | 61.2 |

267.7
18
285 7

| | | |
|---|---|---|
| 255 | | 57.8 |
| 348 | | 58.6 |
| 410 | | 58.2 |
| 450 | | 56.0 |
| 462 | — | 57.4 |
| 510 | — | 58.6 |
| 56 | — | 0.2 |
| [illegible] | | |

60.2

| | | |
|---|---|---|
| 5.10 pm | | 60.4 |
| 50 | | 60.6 |
| 55 | — | 61.6 |
| 42 | — | 64.6 |
| 6.0-4 | — | 64.9 |
| 615 | | 65.10 |
| 27 | | 66.1 |

| | | |
|---|---|---|
| 633 | | 66.6 |
| 50 | — | 66.6 |
| 7.15 | — | 66.0 |
| 20 | — | 66.- |
| 50 | | 68.4 |
| 8.05 | — | 68.6 |

267.7

276.7

[49]

Running at regular rate — rate used in all late experiments was the ¼ mm # to fill through a 70/100 hole a space 4½ from x 6" long

This gives a speed through the hole of 28 m or 90 ft per second and a rate of 1.32 l per min: and 79.2 l per hour = 21 gall.

---

For a 6 hours run 126 gall or 475 l.

---

The theoretical amount is 2.25 # per 100 g Fe $_2O_3$ or 25 l = 6.5 gall.

---

475 l = 42 g

$H_2SO_4$ [illegible] = 2050 g

Zn [illegible]

---

astro size 4 diam.

8" diam 8" long — will conveniently hold 120 g. 160 lbs. will require 50" length and 12" diam 24" — — 14" —

8.20 64.5 284.3 (284.7)

8.40 off

800 gs of Zn consumed

24.6 N = 274 l

800 65.2

July 3rd.

LVII log of sonne carefully rooster feeds (Aylmerton Pickets)

Tonne at ca 775 (some above this limit)

Sonne 65.5

| | | | |
|---|---|---|---|
| 9.7° | — | 47.6 | |
| 10.30 | — | 48.1 | |
| 50 | — | 61.2 | |
| 11. | — | 61.6 | |
| 10 | — | 62.1 | |
| 20 | — | 62.5 | |
| 25 | — | 63.0 | |
| 35 | — | 63.2 | |
| 45 | — | 63.8 | |
| 50 | — | 64.1 | |
| 58 | — | 64.6 | |
| Start 12.08 | — | 65.1 | 179 g. |
| 14 | — | 65.5 | 197 g. |
| 25 | — | 65.6 | |
| 30 | — | | |
| 40 | — | 66.5 | 182 |
| 55 | | 65.4 | |
| 1.20 | | 65.2 | |

[153]

| | | |
|---|---|---|
| 1 30 | 65.4 | 187.1 |
| 1.55 | 65.4 | |
| 2.— | | 189.0 |
| | 65.0 | 189. |
| | 64.1 | |
| | 65.2 | |
| 30 | 65.4 | 190.5 |
| 40 | 64.4 | |
| 45 | 65.1 | |
| 50 | 65.4 | |
| 3.00 | 65.6 | 193.— |
| 10 | 65.1 | |
| 18 | 65.2 | |
| 30 | 65.1 | 194. |
| 40 | 65.4 | |
| 45 | 65.4 | |
| 52 | 65.3 | |
| 4.00 | 65.3 | 196.3 |
| 12 | 65.5 | 196.8 |
| 16 | 65.6 | |
| 25 | 65.7 | 197.3 |

off

Zinc consumed

·11·25 = 1.125

July 4th

VIM

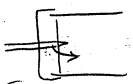
30g $Fe_2O_3$ from Oxalate by roasting at Cowles test. Iron used in generator

750g of Fe turnings

| | | |
|---|---|---|
| 1000. | 47.8 | |
| 10.40 | 64.6 | |
| Start 11 15 | 65.4 | 207.6 |
| 20 | 65.4 | |
| 30 | 65.5 | |
| 35 | 65.9 | |
| 45 | 65.3 | 205.3 |
| 12.00 | 65.4 | 206.3 |
| 12 15 | 65.1 | 207.2 |

Some 400 g Fe remained

— Partially — especially near inlet — reduced to metal. This due to leak in pipe and consequent wrong distribution of $H_2$.



— The run proved the necessity of a small inlet and a lively circulation of gas. Lots of $PbS$ formed.

[15th]

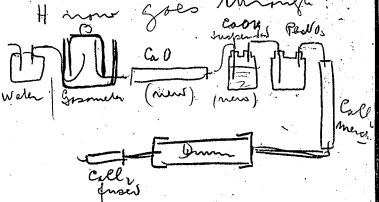
July 4 th.

L IX 50 g of Iodine Shot

Improvements:

Other drum under perfect mouthpiece used.

H now goes through:




while $AgIO_3$ cut out.

Ie gives plenty of gas.

Product $Ca(IO_3)_2$ to be stored for crystallisation and use — Oralate process

Results frequent burning of drum the pipes are bunched closely from time to time

| | | | |
|---|---|---|---|
| 4.35 | — | — | (65.5 = 7.75 %) |
| 4.45 | 6.45 | | |
| .50 | 6.55 | 207.5 | |
| 5.05 | 65.9 | 209 | |
| 15 | 65.9 | | |
| 20 | 65.7 | 216.5 | |
| 10 | 65.4 | | |
| 50 | 65.5 | 211.1 | |
| 6.00 | 65.4 | 212.7 | |
| 6.25 | 65.5 | 214.4 | |
| 35 | 65.5 | | |
| 45 | 65.7 | 215.5 | |
| 7.00 | 65.7 | 216.6 | |

Ammeter exposed while H now slowly flow slowly

Product in small soft lumps. - apparently homogeneous

LX.

50 c.c. $C_2O_4$ from Oxalate
To be reduced in 1st (75 c.c. $H_2SO_4$)
in same way as 4th (9.3 gms)

July 5th
Sunday

| | | | |
|---|---|---|---|
| Start | 4.55 | 65.0 | 220.0 |
| | 10.15 | 64.5 | (229.0) |
| Same conditions | 10 | 65.2 | |
| as last run | 35 | 65.0 | |
| - only not stated | 43 | 64.9 | |
| as will during | 55 | 64.8 | |
| rest of temp | | 64.7 | |
| before start | 11.05 | | 221.5 |
| of $SO_4$. | | | |
| Rate rather | 11.25 | 65.9 | 222.8 |
| slow. | 11.45 | 65.4 | |
| | 12.00 | 65.2 | 225 |
| $H_2SO_4$: 10% | 12.25 | 65.2 | 225.5 |
| used (and | | | |
| 700 g Fe. dissolved) | 12.45 | 65.2 | |
| | 12.55 | 65.4 | 228.7 |
| $H_2SO_4$ and Fe | 1.15 | 65 | 228.1 |
| filled up | 1.40 | 64.8 | 228.7 |
| | 2.05 | | 229 |

In addition to earlier cleaning devices ($H_2O$, $CaCl_2$, $CaO+NaOH$, and $CaCl_2$) we now inserted a bottle containing $KClO_4 + KOH$ to remove $P_2O_5$. Some may combine with $H_2O$ from $P_2O_5$ and KCl, especially by suction of pipet.

Wire of 4 mm Ø

Exp. Test on Os from Oxalate

July 6th 1915

Weight of Ca Cl₂ 2.284 gm.

1.5

Part 11.05 – 64.3 — 2.43

.5 – 64.5

22 – 64.6

25 – 125.–

52 – 65.–

40 – 64.3

45 – 64.7

12.00 – 64.7 – 233.8

10 – 64.5

20 – 64.7

30 – 64.8

45 – 65.4

55 – 65.2

1.00 – 65.3 — 233.7

15 – 65.1

25 – 65.1

33 – 65.1

52 – 65.1

2.00 – 65.2 – 240.5

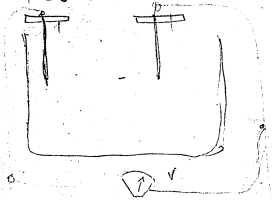
10 – 64.7

25 – 64.7

20 – 64.8 – 241.7

See next page

Resistance

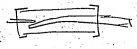



2.40 – 65.0

.50 – 65.0

3.– – 65.0 – 242.9

2 imperfect Drum



[163]

At 3" apart (Wi Y24-Y45

| | | |
|---|---|---|
| 100 m/A | 1.1 | Rem .75 |
| 200 | 1.92 | .21 |
| 300 | .32 | |
| 400 | .39 | |
| 500 | .57 | |

| | | | |
|---|---|---|---|
| 3" | 150 | .32 | 5" ? |
| 2" | | 2.15 | |
| 1" | | 1.85 | |
| 3/4 | | .175 | 1.0 |

at 150 Amps.
Wi.

Brown 370 – 375

Y4

| | | |
|---|---|---|
| 100 | 2.5 | |
| 200 | .41 | 5" Y3. |
| 300 | .57 | |

Grey –

| | | |
|---|---|---|
| 100 | 27 | 16-yards 26 |
| 150 | 35 | |
| 250 | 52 | |

To after Recharging and discharging @ 300 m/AH.

| | | |
|---|---|---|
| 150 m/s | .3 V | !! |
| 250 | .44 | |
| 750 | .55 | Rem 42-yds-1' |

May 14th

Charging test

Wi 400, Le 3257

fully discharged

| | | |
|---|---|---|
| 845 | 150 m/A | 1.28 |
| 9.00 | | 137 |
| 915 | | 1.43 — 75 m/A N |
| 930 | | 144 |
| 945 | | 147 |
| 1000 | | 149 — 1.53 NH4 |
| 1015 | | 149 225 |
| 1030 | | 150 |
| 1045 | | 157 300 m/A gassing slightly |
| 11.00 | | 157 |
| 1115 | | 157 1/10th V gassing |
| 1130 | | 158 |
| 1145 | | 1575 V gassing |
| 12.00 | | 1535 helium V |
| 1215 | | 1545 |
| 1230 | | 1555 |
| 12 45 | | 157 — wants full |
| 1.00 | | 158 |
| 1.15 | | 159 |
| Fully charged | | 160 |

[167]

# LXII July 9th.

50 g $Fe_2O_3$ from Oxalate

Weight of $CaCl_2$ = 243.5 g

| | | |
|---|---|---|
| Start | 10.40 – | 64.5 – 252.8 |
| | 50 – | 64.4 |
| To loose 9.3 g $H_2O$ | 11.00 – | 64.4 |
| | 10 – | 64.4 |
| | 20 – | 64.3 |
| | 25 – | 64.2 |
| | 40 – | 64.4 – 247.1 |
| | 50 – | 64.4 |
| | 12.00 – | 64.5 |
| | 10 – | 64.6 |
| | 40 – | 65.2 |
| | 50 – | 65.3 |
| | 1.00 – | 65.4 – 248.6 |
| | 20 – | 65.4 |
| | 30 – | 65.1 |
| | 40 – | 65.0 |
| | 50 – | 65.0 |
| | 2.00 – | 64.4 |
| ~~Heat broke (platinum tube)~~ | 20 – | 64.4 – 211.9 |

Cast iron Dummy

Dummy ($CaO, Ca(OH)_2$ ($2NO_2, Cu(OH)_2$ impure) and Collar improved Dum.

Collar tube in good.

From a certain point the weight of the bulb does not further increase. It appears to be some oily matter in some condensed hydrocarbon? These may prevent further absorption of $H_2O$.

---

# LXIII 50g $Fe_2O_3$ from oxalate

Coil used for absorbing $CO_2$

Weight = 211.9 g

| | | |
|---|---|---|
| Start | 4.40 – | 64.5 – 221.2 |
| | 5.00 – | 64.7 |
| | 5.00 – | 64.8 |
| | 10 – | 64.1 |
| | 20 – | 64.3 |
| | 27 – | 64.5 |
| | 35 – | 64.4 |
| | 40 – | 64.9 – 215.0 |
| | 50 – | 65.0 |
| | 6.00 – | 64.9 |
| | 10 – | 65.0 |
| | 40 – | 66.0 – 216.6 |
| | 50 – | 65.5 |
| | 7.00 – | 65.2 |
| | 15 – | 65.5 |
| | 22 – | 65.4 |

(69)

Cont. 7.30 – 65.6
40 – 65.8 – 219.5
50 – 65.0
8.00 – 65.0 –
10 – 64.7 – 220.6
20 – 64.6
30 – 64.4
35 – – 221.1

off.

## LXIII. July 10th

50 g. $Fe_2O_3$ from Oxolate
Weight of KCl + 2 2.7 g
7.3
2 3 2.0

Start 11.10 – 64.8
20 – 64.4
11 50 [illegible] 223.7
12 15 [illegible]
35 65.4 [illegible]
1 30 65. 223.6
[illegible]
Off 2 00 6· 223.4

This time an iron piece (Fe) is inserted in Calcium Chloride and Drum and heated by bright red heat, whereby some of the hydrogen gas is supposed to be driven away.

## LXV. July 11th.

50 g. $Fe_2O_3$ from Oxolate of Fe
Weight of Ca Cl2 188.5 g
9.3 g
197.8

Start 11.40 – 64.9
50 – 65.3
12.00 – 65.1
10 – 65.0
20 – 64.9
30 – 65.2
40 – 65.2 – 193.1
1 15 65.5 – 194.7

Cont. 1.50 - 65.5
2.00 - 65.3
10 - 65.1
15 - 65.1 - 197.2
25 - 65.2 - 197.75

Off!

Good gross through.
Water, $CaOH_2$ (suspended)
chromic acid from $K_2Cr_2O_7$ + $H_2SO_4$, $PbNO_3$, $Ca(OH)_2$ suspender, $CaCl_2$.

---

LXVI. July 15 Hr.

As the Chromic acid used does not seem in sensible degree to diminish amount of Hydrocarbons, it is substituted by a sprinkling of $CrO_3$ crystals and $H_2SO_4$ conc. — Rest unchanged

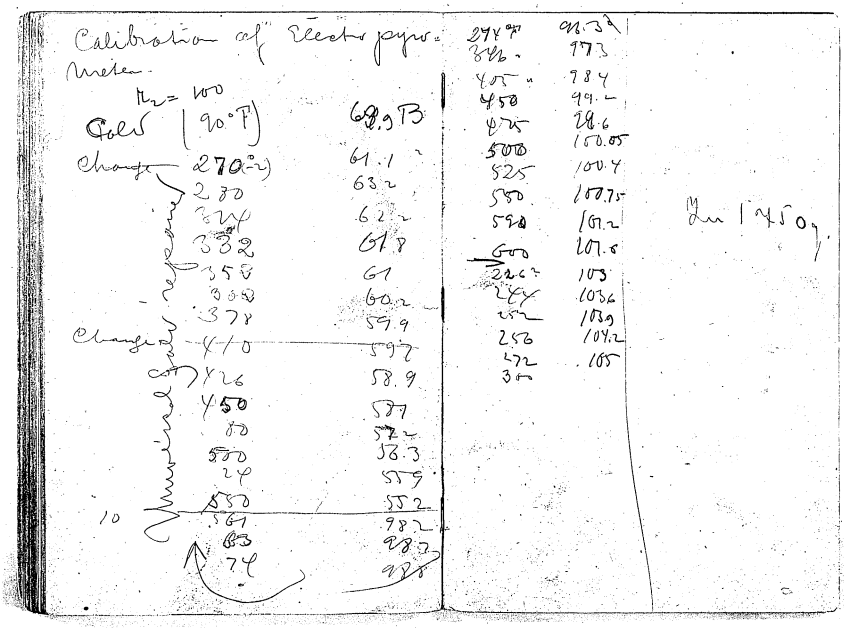
50 g. $Cr_2O_3$ from Oxidation of Fe.
Weight of $CaCl_2$ - 239.1 g.
9.3

Start 2.10 - 64.7 248.4
25 - 64.9 (2.15 No Hydrogen
35 - 65.1
45 - 65.1 -
50 - 65.2 H. again)
3.00 - 65.-
10 - 65.-
20 - 65.-
30 - 65.- 240.5

Cont.

| | | | |
|---|---|---|---|
| 3.40 | – | 65.– | |
| 50 | – | 64.9 | |
| 4.– | – | 64.9 | – 242.1 |
| 10 | – | 64.9 | |
| 20 | – | 64.9 | |
| 30 | – | 64.7 | |
| 40 | – | 65.– | |
| 50 | – | 65.2 | – 246.5 |
| 5.– | – | 65.– | |
| 10 | – | 64.9 | |
| 20 | – | 64.8 | – 241.5 |
| 30 | – | 64.5 | |
| 40 | – | " | – 248.2 |

Off!


Calibration of Electro pyro-
meter.
$R_2$ = 100
Gals | 90°F | 68.9 F
Change 270 (-) 61.1
280 63.2
290 62.2
332 61.8
356 61
300 60.2
378 59.9
Change in reading 410 59.7
426 58.9
450 58.7
58.2
500 58.3
24 57.9
550 55.2
561 98.2
63 98.3
74 97.8
274 98.3
286 97.3
405 98.4
450 99.2
475 98.6
500 100.05
525 100.4
550 100.75
575 101.2
600 101.6
22.5 103
555 103.6
650 103.9
258 104.2
272 105
30
Jun 1950

Nov. Comparative of Bohemian glass.

| | |
|---|---|
| 452.5 | 48.4 |
| 390°F | 53.2 |
| 390 | 53.4 |
| ~~488~~ | 52 |
| 442 | 57 |
| 488 | 58 |
| 532 | 59.3 |
| little above 600 | 60.3 |
| upper point 420 | 61 |
| 460 | 62.4 |
| 514 | 64 |
| 554 | 65.1 |
| | 55.4 |

33

500 lbs in 3 [illegible]
167 lbs. [illegible]
in 10 Drums.
24" [illegible]

68

Q. 5

| To Distance | |
|---|---|
| 520 | 12 |
| 480 | 40 |
| 440 | 35 |
| 480 | 24 |
| 480 | 15 |
| 490 | |
| 500 | |
| 500 | |

| | |
|---|---|
| 11 25 | 12 00 |
| 20 | |
| 54 | 53 |
| 16 | 58 |
| 57 1140 | 6 |
| 19 125 | |
| 6 » 570 | 17 |
| 18 540 | 17 |
| 30 | 1 |
| | 540 44 |
| | 1620 62 |

Q. 5

Start 10 50

11 20

11 06

12 -

12 25

12 10

550 Avg.

520

Slowest unit

520

$a^{x} = b$

$\log_a b = x$

$\log_{10}(ab) = \log a + \log b$

$\log_{10}(a^n) = n \log a$

$\log_{10}\left(\frac{a}{b}\right) = \log a - \log b$

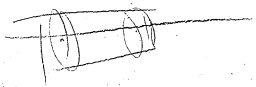
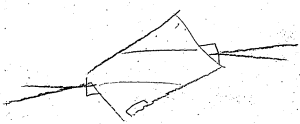
$\log_{10}(1) = 0$

778 foot pounds to one British
14,700 ft lbs = 1 Chevrolet (in 7900 C°)
12,000 mm Coal
1 HP = 33,000 ft. lbs.

French cal = 3.968 British
$\frac{1}{3.968} = .252$

537 cal for evaporation

537 for 1 lbs

212
973
150
1355

770 ft lbs to HP
33000 ft lbs